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CLAIMS

1. A frequency and phase control apparatus, comprising:
a signal input section for receiving a reproduction
5 signal;
an analog/digital conversion section for converting
the reproduction signal into a multiple bit digital signal
based on a clock signal;
a maximum likelihood decoding section for converting
10 the multiple bit digital signal into a binary signal;
a pattern detection section for detecting a pattern
of the binary signal;
a determination section for determining whether or
not the multiple bit digital signal and the clock signal
15 are in synchronization with each other based on the detection
result; and
a clock generation section for adjusting at least
one of a frequency and a phase of the clock signal based
on the detection result and outputting the adjusted clock
20 signal,
wherein when the determination result of the
determination section indicates that the multiple bit digital
signal and the clock signal are in synchronization with each
other, the maximum likelihood decoding section generates
25 a binary signal based on a first state transition rule; and
when the determination result of the determination section
indicates that the multiple bit digital signal and the clock
signal are not in synchronization with each other, the maximum
likelihood decoding section generates a binary signal based
30 on a second state transition rule.
2. A frequency and phase control apparatus according to
claim 1, wherein:

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a number of states and a number of state transition paths of the first state transition rule are restricted based on a first minimum inversion interval defined by a prescribed symbol rule, and

5 a number of states and a number of state transition paths of the second state transition rule are restricted based on a second minimum inversion interval which is shorter than the first minimum inversion interval.

10 3. A frequency and phase control apparatus according to claim 2, wherein:

the first minimum inversion interval is 2,

the second minimum inversion interval is 1,

15 the first state transition rule includes 6 states and 10 state transition paths based on a combination of a recording symbol having the first minimum inversion interval and a PR (a, b, b, a) system, and

20 the second state transition rule includes 8 states and 16 state transition paths based on a combination of a recording symbol having the second minimum inversion interval and the PR (a, b, b, a) system.

4. A frequency and phase control apparatus according to claim 2, wherein:

25 the first minimum inversion interval is 3,

the second minimum inversion interval is 1,

the first state transition rule includes 6 states and 8 state transition paths based on a combination of a recording symbol having the first minimum inversion interval and a PR (a, b, b, a) system, and

30 the second state transition rule includes 8 states and 16 state transition paths based on a combination of a recording symbol having the second minimum inversion interval and the

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PR (a, b, b, a) system.

5. A frequency and phase control apparatus according to claim 2, wherein:

5 the first minimum inversion interval is 2,
 the second minimum inversion interval is 1,
 the first state transition rule includes 4 states
and 6 state transition paths based on a combination of a
recording symbol having the first minimum inversion interval
10 and a PR (a, b, a) system, and

 the second state transition rule includes 4 states and
8 state transition paths based on a combination of a recording
symbol having the second minimum inversion interval and the
PR (a, b, a) system.

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6. A frequency and phase control apparatus according to claim 2, wherein:

 the first minimum inversion interval is 3,
 the second minimum inversion interval is 1,
20 the first state transition rule includes 4 states
and 6 state transition paths based on a combination of a
recording symbol having the first minimum inversion interval
and a PR (a, b, a) system, and

 the second state transition rule includes 4 states and
25 8 state transition paths based on a combination of a recording
symbol having the second minimum inversion interval and the
PR (a, b, a) system.

7. A frequency and phase control apparatus according to
30 claim 2, wherein:

 the first minimum inversion interval is 2,
 the second minimum inversion interval is 1,
 the first state transition rule includes 10 states

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and 16 state transition paths based on a combination of a recording symbol having the first minimum inversion interval and a PR (a, b, c, b, a) system, and

5 the second state transition rule includes 16 states and 32 state transition paths based on a combination of a recording symbol having the second minimum inversion interval and the PR (a, b, c, b, a) system.

8. A frequency and phase control apparatus according to
10 claim 2, wherein:

 the first minimum inversion interval is 3,
 the second minimum inversion interval is 1,
 the first state transition rule includes 8 states
and 12 state transition paths based on a combination of a
15 recording symbol having the first minimum inversion interval and a PR (a, b, c, b, a) system, and

 the second state transition rule includes 16 states and 32 state transition paths based on a combination of a recording symbol having the second minimum inversion interval and the
20 PR (a, b, c, b, a) system.

9. A frequency and phase control apparatus according to claim 2, wherein:

 the first minimum inversion interval is 3,
25 the second minimum inversion interval is 2,
 the first state transition rule includes 6 states and 8 state transition paths based on a combination of a recording symbol having the first minimum inversion interval and a PR (a, b, b, a) system, and

30 the second state transition rule includes 6 states and 12 state transition paths based on a combination of a recording symbol having the second minimum inversion interval and the PR (a, b, b, a) system.

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10. A frequency and phase control apparatus according to claim 2, wherein:

- 5 the first minimum inversion interval is 3,
 the second minimum inversion interval is 2,
 the first state transition rule includes 4 states
and 6 state transition paths based on a combination of a
recording symbol having the first minimum inversion interval
and a PR (a, b, a) system, and
10 the second state transition rule includes 4 states and
6 state transition paths based on a combination of a recording
symbol having the second minimum inversion interval and the
PR (a, b, a) system.

15 11. A frequency and phase control apparatus according to claim 2, wherein:

- the first minimum inversion interval is 3,
 the second minimum inversion interval is 2,
 the first state transition rule includes 8 states
20 and 12 state transition paths based on a combination of a
recording symbol having the first minimum inversion interval
and a PR (a, b, c, b, a) system, and
 the second state transition rule includes 10 states and
16 state transition paths based on a combination of a recording
25 symbol having the second minimum inversion interval and the
PR (a, b, c, b, a) system.

12. A frequency and phase control apparatus according to claim 1, wherein:

- 30 when intervals between a plurality of
synchronization patterns included in the detected pattern
have a defined value for a prescribed number of times in
series, the determination section determines that the

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multiple bit digital signal and the clock signal are in synchronization with each other, and

when intervals between a plurality of synchronization patterns included in the detected pattern
5 do not have a defined value for a prescribed number of times in series, the determination section determines that the multiple bit digital signal and the clock signal are not in synchronization with each other.